

## Claims

What is claimed is:

1. A method for fixing problems in a CAD database having faces, edges and vertices, comprising:  
adjusting the shape of at least one face, the shapes of each edge connected to said face, and positions of each vertex connected to said face to reduce to a specified tolerance the gap errors, cross-tangency tolerances, and cross-curvature tolerances associated with said face.
2. The method as claimed in claim 1 further comprising the step of iteratively adjusting the shape of a plurality of free-form faces in the CAD database, the shape of each edge connected to each face and the position of each vertex connected to said face to eliminate all gap errors associated with said plurality of faces.
3. The method as claimed in claim 1 where the gap, cross-tangent, and cross-curvature tolerances are computed by comparing surface evaluations taken at sample points on the shapes being adjusted and those points on neighboring faces nearest to the sample points.
4. The method as claimed in claim 1 where said face is an analytic face, further comprising the step of converting said analytic face into a free-form face before it is deformed.
5. A method for fixing problems in a CAD database having faces, edges and vertices, comprising:  
adjusting the shape of an edge to eliminate or reduce to a specified tolerance the gap errors between said edge and a face connected to said edge and the gap errors between said edge and a plurality of vertices connected to said edge.

6. The method as claimed in claim 5, where the edge is an analytic edge, further comprising the step of converting the analytic edge into a free-form edge before it is deformed.
7. A method for fixing problems in a CAD database having curves and surfaces, comprising:
  - modifying a curve by
    - finding a modified curve shape that interpolates a set of point locations and minimizes the gap errors between said curve and a surface connected to said curve while minimizing deviations from the original shape face of said curve where the gap errors are expressed as constraints that must be satisfied or minimized; and
    - applying said modified curve shape to said curve.
8. The method as claimed in claim 7 where the shapes are represented as B-splines.
9. The method as claimed in claim 7 where the shapes are represented as NURBs.
10. A method for fixing problems in a CAD database having curves and surfaces, comprising:
  - modifying a surface by
    - finding a modified surface shape that interpolates a set of point locations, minimizes the gap errors between said surface and a set of curves connected to said surface, approximates the cross-tangent values for every point along each curve in said set of curves, and approximates the cross-curvature values for every point along each curve in said set of curves while minimizing deviations from the original shape face of said surface where the gap errors, cross-tangency tolerances, and cross-curvature tolerances are expressed as constraints that must be satisfied or minimized; and
    - applying said modified surface shape to said surface.

11. The method as claimed in claim 10 where the shapes are represented as B-splines.
12. The method as claimed in claim 10 where the shapes are represented as NURBs.